The following report, furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean:

On the 23d, s. s. "City of Montreal," in 40° 59′ N., 55° 25′ W., wind s. to w.n.w., fresh gale and beam sea, to moderate wind and heavy sea.

Ocean data from other sources: 22d, s. s. "Holland," in lat. 41° 46′ N., long. 54° 51′ W., strong n.w. to s.w. gale, heavy s.s.w. sea, ship rolling heavily. Same date, s. s. "Vaderland," in lat. 40° 15′ N., long. 55° 22′ W., heavy w. gale, high sea; Same date, s. s. "Britannic," in lat. 44° 09′ N., long. 44° 10′ W., strong w. gale, very heavy sea. 23d, s. s. "Holland," in lat. 41° 30′ N., long. 57° 56′ W., s.s.w. gale, high confused sea. Same date, S. S. "Elbe," in lat. 40° 53′ N., long. 55° 58′ W., strong s.w. to n.w. gale, high head sea.

VIII.—This depression probably developed in British Columbia, but did not appear in the northwest until midnight of the 22d, when the barometer was lowest in Manitoba. It passed rapidly toward the upper St. Lawrence valley on the 23d with increased energy, the barometer having fallen to 29.72 by midnight of the 23d, when the disturbance was central near Kingston. High northwest winds occurred in the lake regions on the 23d, attended by fair weather and temperature below freezing. The morning report of the 24th showed a change in direction to the northeast. The centre of disturbance was advanced to FatherPoint, where the barometer had fallen to 29.53. South to west gales were reported from the St. Lawrence valley on the 24th, with heavy snows, and with temperature below zero at Rockliffe. The afternoon report of the 24th showed an increase of barometric gradients in the southern quadrants of this storm, the centre being located east of Father Point, where the pressure was 29.30. By midnight the area of lowest pressure had passed to the east of the maritime provinces, where the barometer was rising with westerly gales. At the same report the wind at the summit of Mount Washington attained a velocity of 82 miles, northeast; the afternoon report from Mount Washington on the same day, gave the wind as 112 miles, north.

Cautionary signals were ordered at stations on the upper lakes and Atlantic coast, at the afternoon report of that date.

The following maximum velocities were reported: Sandy Hook, 40 miles, n.w.; Breakwater, 36, n.w.; Buffalo, 38, s.w.; Milwaukee, 36, w.; Alpena, 36, n.w.; Shoreham, 36., n.w.

The following reports, furnished through the co-operation of "The New York Heard Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean. On the 26th, s. s. "Arizona" in lat. 41° 26′ N., long. 60° 34′ W., fresh gale, latter part, snow-squalls, winds s.s.w. to n.n.w. 27th, s. s. "Adriatic" in lat. 43° 32′ N., long. 41° 55′ W., moderate gale, squally, heavy head sea, wind s.w. to n.w. 28th, in lat. 41° 28′ N., long. 47° 30′ W., moderate gale during day, winds west.

IX.—This depression was first observed in British America, north of Dakota on the 24th, but its centre could not be located on the tri-daily charts until the midnight report of that date, when the barometer was lowest near Fort Garry. From this point the course of this storm was almost due south, until reaching central Iowa, where, after a slight movement to the east during the eight hours following the afternoon report of the 25th, its course changed to the southwest, and at the following report its centre was located in Kansas. During the 26th this storm moved over the lake region developing great energy, the barometer falling to 29.30, the lowest isobar being elliptical in form, the longer axis pointing to the northeast. This storm was followed by a secondary depression in the lower Mississippi valley on the 27th, which disappeared in advance of a high area from the northwest and a norther on the Texas coast. When this storm was central north of Lake Ontario dangerous westerly winds continued in the lake region and on the Atlantic coast, as far south as Jacksonville. The barometer fell to 29.13 at Father Point at midnight of the 27th, with wind s.w., fifty-five miles, and to 29.12 at Anticosti, with light southeast winds. At the last report the wind at Father Point was w., thirty-three miles.

Cautionary Signals were ordered for stations on Lakes Erie, Michigan and Huron at 4 p. m. of the 25th, and for stations on the Atlantic coast to New York on the morning of the 26th; and for stations between New York and Boston, at midnight of the 26th. Cautionary Signals for Eastport, Portland, Oswego and Rochester, were ordered on the morning of the 27th.

The reports show that this was one of the most severe storms of the season, especially over the maritime provinces. The following maximum velocities were reported at Signal Service Stations: Hatteras, 48, s.w.; Kittyhawk, 47, s.w.; Cape May, 44, s.; Breakwater, 48, s.; New Shoreham, 44, s.w.; Rochester, 36, n.w.; Sandusky, 36, s.w.; Provincetown, 37, s.w.

The following report, furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm, during its passage to the eastward over the ocean:

On the 27th, s. s. "Bothnia" in lat. 42° 03′ N., long. 57° 50′ W., strong breeze with squalls and high head sea; wind northwest.

X.—This depression was at no time within the limits of the stations of observation, but passed to the east, north of the United States, first appearing north of Dahota on the 28th. The course of the storm changed to the southeast after reaching the longitude of the lake region, and the disturbance became violent over Lakes Michigan and Superior, the wind reaching a velocity of forty-one miles at Milwaukee on the 29th. The gradient increased rapidly in the south and west quadrants of this storm as it moved to the northeast down the St. Lawrence valley and disappeared on the 31st, attended by violent gales at Father Point, Anticosti and other stations in the northeast.

## INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of the REVIEW. The former is published for January, 1880, and continues the series of that chart begun in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean," previously furnished this office through the courtesy of Prof. Dr. G. Newmayer, Director of the German Marine Observatory, has not been received for the month of January, 1880, and therefore was not used in the preparation of the present chart, as in the previous month. Chart v. is prepared for the month of April, 1880, and continues the series of that chart, begun in November, 1877.

Chart iv. shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of January, 1880, over the northern and at certain isolated stations in the southern hemisphere. The pressure is generally high, and is considerably above the average. There are two areas of comparatively low pressure, the most decided occupying Iceland and the southern part of Greenland, lowest mean reading, 29.58 at Stykkisholm; the least important, central over or near British Columbia, lowest mean reading, 29.90 at Olympia.

The position of the former low area is nearly a constant feature o that part of the Arctic regions where for the past three years the mean pressure has not risen above 30.00, except as follows: April, 1877, Godthaab, 30.02; May, 1877, Stykkisholm, 30.04; August, 1877, Godthaab, 30.06; November, 1878, Stykkisholm, 30.06; December, 1878, Stykkisholm, 30.10.

There are five decided areas of barometric maxima for the month, distributed as follows: In central Asia, 30.70; in central Mexico, 30.40; in eastern France and western Germany, 30.40; in the Middle Atlantic states, 30.20; in 35° N., 60° W., 30.20. The high pressure over central Europe appears to result from an extension northeastward of the barometric maxima prevailing in the vicinity of the Azores and Maderia Islands and thence to the south and west along parallel 30° N.

Compared with the corresponding chart for December 1879, the preceding month, there has been a general increase of pressure over Europe, Asia, and Northern Africa, within the limits of the stations of observation. The most marked increase is in eastern Siberia, where the small area of mean high barometer observed during the last month has extended, and now covers the northern portion of Asia, the pressure at the centre having increased from 30.49 to 30.74. The area of mean low barometer continues central over Greenland, the pressure at the centre having increased about .1 of an inch. Over the Atlantic, the barometer has fallen slighty between Newfoundland and the British Isles. The low area previously to the north of this latitude has extended southward along the 30th meridian west of Greenwich, while the gradient has increased decidedly from this meridian eastward towards the European coast. The high area of the North Atlantic has remained almost stationary, and is now central in lat. 35° N. long. 60° W., where the mean height of the barometer is 30.20. The area of high barometer which was central in Manitoba during the preceding month, has disappeared, and the low area from the North Pacific now extends over the western portion of British America.

The following extreme monthly mean temperatures are given in Fahrenheit's scale; *Lowest*: York Factory, —28°; Nertschinsk, —22°; Yeniseisk, —16°; Nikolaievsk on the Amoor, —11°; Barnaul, —6°; Fort Garry, —5°; Moose Factory, —2°. *Highest*: Fort Napier, 81°; Poona, 81°; Mauritius, 80°; Paramaribo, 79°; Peurto Berrio, 79°; Bridgetown, 78°; Navassa, 76°; Bombay, 76°; Fort de France, 75°; Kingston, 74°; Santiago de Cuba, 73°.

The prevailing direction of the wind over the United States was, northeasterly on the Atlantic coast; northerly on the Pacific coast south of Oregon; southerly in the Mississippi valley and the lake region; variable at the Rocky mountain stations; southerly in the plateau region and on the North Pacific coast. Over the Atlantic, the northeast trade-winds prevailed south of the 30th parallel; northwesterly winds over the North Atlantic west of the 40th meridian, and southwesterly, east of that meridian. In Europe: south to west in the British Isles; southeast to southwest in France and Spain; westerly in Russia. In India: variable and northerly on the coasts of China and Japan.

Compared with the corresponding month of January, 1879, the area of low barometer, central over Greenland, was more clearly marked. The pressure at the centre was then 29.36, or about .2 of an inch below that reported for the present month. The pressure over the North Atlantic was also from .2 to .3 of an inch below that of January, 1880. The pressure is about .2 of an inch lower on the North Pacific coast, where in January, 1879, the barometer ranged from 30.10 to 30.20. In central Asia, the barometer is .3 of an inch higher and the temperature is 10° lower.

The effect of the relative position of the high and low areas of pressure on the prevailing winds for the month, is shown by comparing this chart with the corresponding chart of January, 1879 when the area of mean low pressure was central in the North Atlantic, south of its present position, thus causing east to south winds at stations in western Europe; while, during January, 1880, the winds in northern Europe are westerly, tending toward the secondary low area, which has taken the place of the high area extending over that region during the previous year.

Compared with January of preceding years, the temperature over the United States was above the normal in all districts east of the Rocky mountains. It was from 10° to 15° above in the Upper Mississippi valley, Missouri valley, lake region, Ohio valley and southern states, and 8° to 9° in the New England and Middle Atlantic states. On the Pacific coast it was 7° below the normal for the mouth at Sacramento; 4° below at San Francisco; 1°.4 below at San Diego, and from 9° to 11° above at Umatilla and Boise City.

The following table exhibits the mean temperature and mean pressure for the month of January, 1880, in the several countries of Europe and Asia, compared with the means as determined from the years 1877, 1878, and 1879:

| Countries. | Temperature. | | Barometer. | |
|---|---|---|---|---|
| | Mean, January, 1877, 1878 and 1879. | Mean, January, 1880. | Mean, January, 1877, 1878 and 1879. | Mean, January, 1880. |
| Algiers | 56.9 | 52.9 | 30.15 | 30.24 |
| Austria | 35.3 | 27.8 | 30.08 | 30.32 |
| British Isles | 41.2 | 40.6 | 29.94 | 30.25 |
| Denmark | 30.5 | 34.2 | 29.96 | 30.22 |
| France | 44.4 | 37.6 | 30.07 | 30.37 |
| Germany | 33.5 | 30.0 | 30.05 | 30.30 |
| India | 75.9 | 69.5 | 29.37 | 29.96 |
| Italy | 50.3 | 43.6 | 30.03 | 30.26 |
| Norway | 29.0 | 32.4 | 29.84 | 29.89 |
| Portugal | 52.9 | 49.7 | 30.21 | 30.27 |
| Russia | 21.2 | 19.8 | 30.18 | 30.06 |
| Sweden | 25.6 | 26.0 | 29.88 | 29.92 |
| Spain | 53.3 | 51.2 | 30.16 | 30.27 |
| Turkey | 49.9 | 41.6 | 30.04 | 30.22 |

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of January, 1880, as compared with the means for the past three years:

*Comparative Thermometric and Barometric Means, with corresponding Departures.*

| STATION. | Mean Temperature. | | | Mean Barometer. | | |
|---|---|---|---|---|---|---|
| | January, 1877–78–79. | January, 1880. | Departure. | January, 1877–78–79. | January, 1880. | Departure. |
| | ° | ° | ° | | | |
| York Factory | —20.5 | —27.6 | — 7.1 | 30.04 | 29.98 | —0.06 |
| Godthaab | 16.9 | 10.4 | — 6.5 | 29.35 | 29.59 | +0.24 |
| Stykkisholm | 29.5 | 32.9 | + 3.4 | 29.49 | 29.58 | +0.09 |
| Tromso | 28.5 | 30.7 | + 2.2 | 29.70 | 29.55 | —0.15 |
| Thorshavn | 37.6 | 41.4 | + 3.8 | 29.71 | 29.91 | +0.20 |
| Archangel | 10.0 | 8.1 | — 1.9 | 30.00 | 29.76 | —0.24 |
| Ekaterinburg | 6.5 | — 0.6 | — 7.1 | 30.29 | 30.22 | —0.07 |
| Barnaul | — 2.9 | — 6.0 | — 3.1 | 30.60 | 30.63 | +0.13 |
| Yeniseisk | —11.4 | —15.9 | — 4.5 | 30.43 | 30.70 | +0.27 |
| Nikolaievsk on the Amoor | — 4.2 | —10.5 | — 6.3 | | | |
| Zi-Ka-Wei | 33.9 | 35.1 | + 1.2 | 30.42 | 30.42 | Normal |
| Tokei | 35.4 | 33.1 | — 2.3 | 30.10 | 30.09 | —0.01 |
| Pekin | 21.3 | 19.9 | — 1.4 | 30.44 | 30.48 | +0.04 |
| Nukuss | 25.4 | 21.0 | — 4.4 | 30.30 | 30.23 | —0.07 |
| Beirut | 61.9 | 54.7 | — 7.2 | 30.07 | 30.11 | +0.04 |
| Mauritius | 82.7 | 80.2 | — 2.5 | 29.94 | 29.98 | +0.04 |
| Fort Napier | 77.4 | 80.6 | + 3.2 | 29.81 | 29.79 | —0.02 |
| Paramaribo | 79.4 | 79.4 | Norm'l | 30.00 | 29.93 | —0.07 |
| Funchal | 64.8 | 64.6 | — 0.2 | 30.25 | 30.18 | —0.07 |
| Ponta Delgado | 61.3 | 60.3 | — 1.0 | 30.23 | 30.02 | —0.21 |
| Bridgetown | 80.5 | 78.3 | — 2.2 | 30.01 | 29.91 | —0.10 |
| Navassa | 78.5 | 75.8 | — 2.7 | | | |
| Melbourne | 62.6 | 63.5 | + 0.9 | 30.00 | 29.94 | —0.06 |
| Hobart Town | 67.2 | 62.7 | — 4.5 | 29.85 | 29.82 | —0.03 |
| Astrakhan | 24.4 | 18.9 | — 5.5 | 30.30 | 30.16 | —0.14 |
| Athens | 53.4 | 46.9 | — 6.5 | 30.04 | 30.26 | +0.22 |
| Tiflis | 40.5 | 31.5 | — 9.0 | 30.21 | 30.18 | —0.03 |
| Laghouat | 56.1 | 51.1 | — 5.0 | 30.15 | 30.29 | +0.14 |
| Fort de France | 76.8 | 74.5 | — 2.3 | 29.93 | 29.93 | Normal |
| Lisbon | 55.1 | 50.4 | — 4.7 | 30.17 | 30.28 | +0.11 |
| Sandwick Manse | 38.2 | 41.8 | + 3.6 | 29.85 | 30.12 | +0.27 |
| Malta | 59.1 | 56.6 | — 2.5 | 30.02 | 30.13 | +0.11 |

Chart V.—This chart displays the tracings of the probable courses of forty-three of the principal storm areas of the northern hemisphere for the month of April, 1880. The approximate paths of progressive movement are based upon about seven hundred daily simultaneous international observations. In addition, a mass of irregular data reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given:

Fifteen areas traversed portions of the United States, four of which entered from the Pacific ocean, two over California, and two over British Columbia, the rest entering from the British Possessions. Two areas entered the northwest coast of the British Possessions and two others pursued peculiar paths skirting the northwestern coast of North America. Four areas crossed the ocean to the mainland of Northern Europe. Several others very probably made the passage but could not be traced on the chart owing to lack of data. Fifteen areas

traversed parts of the North Atlantic ocean. Nine areas appeared over Europe, being chiefly confined to th northern and southern parts of the continent. Three areas passed northeastward over eastern Asia and four in the vicinity of the Japan Islands.

Of the storms first appearing in North America, the following brief descriptions are given:

I.—This depression appeared in the northern slope on the 1st and passed rapidly southeastward into the Lower Missouri valley where it was central during the 2d. During the 3d and 4th it occupied the lake region, and by the morning of the 5th became central in the Lower St Lawrence valley inclosed by the isobar of 29.40; 6th, central over the Gulf of St. Lawrence, passing thence northward to Greenland. During the 7th, 8th, and 9th the depression passed slowly eastward south of Godthaab, and on the 10th and 11th moved northeastward between Greenland and Iceland disappearing near the parallel of 70° N. The following observations indicate the influence of its passage northeastward in the vicinity of these islands; 7th, Godthaab, 29.27 a fall of 0.34 inch, s., force 4, snowing; Stykkisholm, 29.91, a rise of 0.26 inch, w., force 2, cloudy. 8th, Godthaab, 29.28, s., force 4, snowing; Stykkisholm, 29.88, s., force 7, cloudy. 9th, Godthaab, 28.85, n., force 2, cloudy; Stykkisholm, 29.77, s., force 8, cloudy. 10th, Godthaab, 29.65, calm, cloudy; Stykkisholm, 29.95, calm, raining. 11th, Godthaab, 29.78, calm, fair; Stykkisholm, 29.89, s. force 8, cloudy.

II —Central on the 1st in the Middle Pacific coast region. The depression passed northeastward on that day and the following into Montana. On the 3d, central in northern Dakota, it probably merged with area iii. at that time occupying the region north of Lake Superior.

III.—On the 1st the barometer at York Factory, B. A., fell 0.59 inch, wind n.w., snowing, central area inclosed by the isobar of 29.60. During the 2d and 3d, the depression moved southeastward north of the upper lake region, while southerly winds, with occasional rain prevailed from New England westward to Dakota.. On the 4th the depression combined with area I, then central in the Lower Lake region.

VIII.—This depression appeared off the Middle Pacific coast region in the vicinity of parallel 40° N., on the morning of the 2d, central area inclosed by the isobar of 29.40. San Francisco, 29.63, a fall of 0.28 inch, s.w., light rain; Sacramento, 29.56 a fall of 0.36 inch, s., heavy rain; Red Bluff, California, 29.39 a fall of 0.51 inch, s.e., light rain; Roseburg, Oregon, 29.30 a fall of 0.57 inch, n.w., light rain. 3d, depression central off the coast of Washington Territory, and moving northwestward. Olympia, 29.45, s.w., threatening; Esquimalt, Vancouver's Island, 29.44, n., cloudy. During the remainder of the storm's course, the position of the central area of barometric minima on the various days is located with some uncertainty, owing to insufficient reports. 4th, depression probably central off the northwestern coast of British Columbia; barometer at Sitka rose 0.05 inch, wind s.s.e., cloudy. 5th, depression moving to the westward off the Island of Baranoff, Sitka, 29.67, a fall of 0.10 inch, s.e., force 5, cloudy. 6th, Sitka, 29.67, e., force 3, cloudy. The further course of the depression could not be indicated upon the chart owing to the lack of reports.

IX.—Forming as a secondary depression to area ii., this area became central on the morning of the 3d in the Middle Slope, inclosed by the isobar of 29.40. Dodge City, 29.18, a fall of 0.05 inch, n., foggy; North Platte, 29.22, a fall of 0.09 inch, s.e., foggy. During the day the depression passed northeastward over the Lower Missouri valley combining on the following day with area i., then central in the lower lake region.

XIII.—This depression appeared to result from the westward movement of area viii. 8th, Sitka, 29.96 a rise of 0.15 inch, s.s.w., force 1, cloudy. 9th, Sitka, 29.69, a fall of 0.27 inch, w.n.w., force 1, cloudy. During the day the depression curved to the southeastward as it entered the British Possessions. 10th, Sitka, 29.49, a fall of 0.20 inch, calm, cloudy. After this day the course of the area could not be traced with accuracy owing to insufficient reports, but there seemed to be evidence that the depression formed a part of area xix.

XIX.—Central in Manitoba on the morning of the 12th the depression passed southward through Minnesota, and during the 13th combined with area xxi., then central in the Lower Missouri valley.

XIV.—This depression passed southeastward from the region of Hudson's bay during the 8th and 9th, and on the following morning occupied the western part of the lower lake region, inclosed by the isobar of 29.60. By the morning of the 12th it was central, with diminished energy, over the Gulf of St. Lawrence; 13th, probably central off the coast of Labrador. The influence of this depression as it passed northeastward over Greenland and Iceland, is shown by the following reports: 13th, Godthaab, 29.26, a fall of 0.64 inch, s., force 2, snowing; Stykkisholm, 30.11, w., force 4, clear. 14th, Godthaab, 28.93, a fall of 0.33 inch, s., force 7, fair; Stykkisholm, 30.00, a fall of 0.11 inch, s., force 4, cloudy. 15th, Godthaab, 29.36, a rise of 0.43 inch, s., force 7, snowing; Stykkisholm, 29.81, a fall of 0.19 inch, s.w., force 6, raining. 16th, Stykkisholm, 29.69, a fall of 0.12 inch, e., force 2, cloudy. During the day the depression disappeared to the north of Iceland in the vicinity of parallel 70° North.

XX.—This depression appeared on the 12th off the North Pacific coast region inclosed by the isobar of 29.80. Light rains with southwest to northwest winds prevailed in Oregon and Washington Territory. During this day, and the following, the depression moved with slight energy northeastward along the western coast of British America, and on the 14th disappeared to the westward in the vicinity of the meridian of 140° West.

XXI.—Central on the 13th in the Middle Plateau region the depression passed rapidly east and northeast to the upper lake region, and by the morning of the 15th became central in the vicinity of James' Bay. Moose Factory, 29.21, a fall of 1.06 inches, s.w., cloudy. During the 16th, 17th and 18th the depression passed slowly northeastward over Davis Straits and Greenland, combining on the 19th with area xxiii., then central southwest of Iceland.

XXII.—This depression appeared off the northwestern coast of British America on the 14th, and passed slowly eastward into the interior, being central on the 16th north of British Columbia inclosed by the isobar of 29.40. On the 18th the depression became central in the Saskatchewan valley, and by the morning of the 20th occupied eastern Montana; 21st, central in the Middle Slope inclosed by the isobar of 29.60. During the day the depression passed rapidly eastward over the upper Lake region, disappearing on the 22d in the Lower St. Lawrence valley.

XXVI.—This depression appeared central in northern Texas on the 15th, inclosed by the isobar of 29.60. During this day and the following, the depression passed rapidly eastward to the lower lake region, and thence southeastward on the 17th off the New England coast; 18th, central south of Nova Scotia. In 38° 46′ N., 64° 22′ W., 29.77, n.w., force 6, 5 hours rain, hazy weather; in 41° N., 63° W., n.w., strong gale. 19th, in 39° 38′ N., 58° 49′ W., 29.80, n., force 7, 2 hours rain, hazy weather; in 42° 44′ N., 50° 56′ W., 29.64, s., force 2, dense fog. During the 20th and 21st the depression passed rapidly northeastward west of the British Isles, and on the morning of the 22d was central east of Iceland. Stykkisholm, 29.34, s.w., force 2, raining; Thorshavn, 29.40, n.w., force 5, fair. 23d, central off the northwestern coast of Norway. From the 24th to the 27th the depression passed slowly eastward over northern Russia, and on the 28th, became central in the valley of the Obi. 30th, the depression disappeared eastward beyond the Yenesi.

XXVIII.—Appearing on the 17th in the middle slope, the depression moved northeastward to the upper lake region, where it became central on the 19th Marquette, 28.93, a fall of 0.87 inch, s., cloudy; Duluth, 28.89, a fall of 0.79 inch, n.w., cloudy; Escanaba, 29.00, a fall of 0.86 inch, s.w., cloudy; St. Paul, 29.07, a fall of 0.40 inch, n.w., sleeting; 20th, central

northeast of James's Bay, with diminished energy, and by the following morning the barometer at Godthaab, Greenland, had fallen 0.38 inch, wind shifting from n.e., force 4, clear weather, to s., force 7, snowing. During the 22d the depression disappeared to the eastward north of Iceland.

XXIX.—This depression entered the northwestern coast of British America on the 18th and 19th, and by the morning of the 20th was central in British Columbia inclosed by the isobar of 29.60. During the day it combined with xxxi., then central in the northern plateau.

XXXI.—This depression entered the North Pacific coast region on the 20th, and by morning of the 22d, occupied central Montana. Virginia City, 29.38, calm, light snow. 23d, central in the Lower Missouri valley, inclosed by the isobar of 29.00. Light to heavy snow, with southwest to northwest winds in Colorado and Montana, and light to heavy rain, with southeast to northeast winds in the Upper Mississippi and Lower Missouri valleys and the Northwest. From the 24th to the 26th it passed slowly northeastward to the upper lake region, and, by the following morning, became central over the Gulf of St. Lawrence. 28th, the depression central off the southern point of Greenland. Godthaab, 29.42, a fall of 0.33 inch, wind shifted from south to northeast. On the 30th, this depression combined with area xli., while central off the eastern coast of Greenland.

XXXII.—This depression appeared central on the 20th in the Eastern Gulf States, and, during the day, moved rapidly eastward off the coast; 21st, probably central northeast of the Bermudas, moving thence rapidly northward to parallel 50° North. Changing its course slightly to the west of north, the depression, on the 25th, became central off the southeastern coast of Greenland. Godthaab, 29.26, a fall of 0.50 inch, n.e., force 4, cloudy. During this day and the two succeeding, the depression skirted the eastern coast of Greenland and disappeared on the 27th in the vicinity of parallel 70° North.

XXXIX.—Central in the Saskatchewau valley on the 27th, this depression moved southeastward into the Lower Missouri valley, and thence northeastward to the upper lake region, in which latter district it was central on the 29th, inclosed by the isobar of 29.60. During the day it moved eastward to the Lower St. Lawrence valley, where it was central on the morning of the 30th. The continuation of this area will appear on chart v. for May, 1880.

XL.—This depression passed northeastward from its position on the morning of the 28th, in about 47° N., 148° W., to the northwestern coast of British America, which it entered during the 30th. The continuation of this area will probably appear on chart v. for May, 1880.

Of the storms first appearing over the Atlantic ocean, the following brief descriptions are given.

IV.—This depression is a continuation of area xxv. of chart v. for March, 1880. It was central on the 1st, southeast of Newfoundland and passed northeastward between the parallels of 45° and 55° N. On the 4th, combined with area vi., then central off the northwestern coast of the British Isles; 4th, in 54° 30′ N., 17° W., 29.10, w., force 6, squally; in 52° N., 29° W., strong n.w. gale; in 54° N., 18° W., hard w.s.w. to w. gales, with very high sea.

VI.—This depression is a continuation of area xxii. of chart v. for March 1880, central on the 1st east of Greenland, it moved slowly southeastward to the northern portion of the British Isles, where it was central on the 6th. During this period of movement the following reports show the influence of the depression. 1st, Stykkisholm, 28.81, s.e., force 9, raining; Thorshavn, 29.41, s.e., force 5, fair; North Unst, 29.53, s.s.e., force 8, cloudy. 2d, Stykkisholm, 28.74, e., force 7, raining; Thorshavn, 29.11, s.e., force 7, raining; North Unst, 29.38, s.s.e., force 8, cloudy. 3d, Stykkisholm, 28.82, e., force 7, cloudy; Thorshavn, 29.03, s.w., force 5, fair; North Unst, 29.22, s.s.e., force 8, cloudy. 4th, Stykkisholm, 29.06, n.e., force 4, snowing; Thorshavn, 28.98, se., force 7, fair; North Unst, 29.10, s., force 6, cloudy. 5th, Stykkisholm, 29.30, n.e., force 7, clear; Thorshavn, 28.96 e., force 3, cloudy; North Unst, 29.04, s., force 6, cloudy; Monach Light-house, 28.81, w.s.w., force 7, cloudy. On the 6th throughout the British Isles the barometer fell below 29.35, with southwest to northwest winds, and with rainy or threatening weather. During the 7th, the depression moved rapidly southeastward into central Europe; 10th, central in northeastern Turkey, and on the 11th disappeared east of the Black sea.

XII.—This was central on the 7th south of Nova Scotia. It was accompanied by northeasterly winds and clearing weather in the Canadian maritime provinces, except in Newfoundland, and by southerly winds, with rain, near parallel 40° N.; 8th, in 47° 45′ N., 40° 40′ W., 29.74, s.s.e., force 6, cloudy; in 42° 26′ N., 46° 43′ W., 29.79, w., force 4, moderate sea. During the 9th, the depression passed northward from near 55° N., 45° W., and on the 10th it combined with area i., then central between Greenland and Iceland.

XVIII.—This depression appeared and was central on the 11th, in about 45° N., 25° W., and, during this day and the following, it passed southeastward into northern Spain, where it became central on the 13th. Bilbao, 29.65, a fall of 0.14 inch, s., cloudy; Madrid, 29.74, a fall of 0.20 inch, s., 28 miles per hour, cloudy; Santiago, 29.48, a fall of 0.09 inch, s.e., raining. It was central in Portugal on the 14th, and moved eastward over southern Spain, disappearing on the 15th on the western coast of the Mediterranean.

XXIII.—Central off the Banks of Newfoundland on the 14th, the depression moved eastward along the parallel of 50° N., until the 16th, when it changed its course to the northeast, becoming central od the 19th, south of Iceland. On the 20th, the depression moved from a position southwest of Iceland, northeastward over that island, and, on the 22d, combined with area xxvi. It was then central north of the Faroe Islands. The following ship reports give evidence of the influence of the depression:

14th, in 42° N., 55° W., n.w. and w.s.w., heavy storm, snow, and hail squalls, very high sea; in 47° N., 32° W. s.w. to n.w., very stormy, rain and heavy sea; in 51° N., 30° W., s.e. to s.w. and n.w., strong gales, very high sea, much water on deck, heavy rain, snow and hail at intervals; in 46° 44′ N., 47° 20′ W., w. and n.w. strong gales, very heavy sea. 15th, in 45° N., 46° W., s.w. to n.w. strong gale, very high sea; in 47° N., 36° W., s. to n.w., strong to heavy gale, thunder and lightning and heavy sea; in 49° N., 34° W., n.w. and w.n.w., tempest, very high sea and breakers, hail and rain; in 47° 10′ N., 31° 25′ W., 29.55, w.s.w., force 6, very high sea, raining; in 49° 33′ N., 24° 40′ W., 29.76, s., force 5, cloudy and threatening; in 46° 33′ N., 37° 23′ W., 29.55, n.w., force, 8, rain and hail showers. 16th, in 48° 05′ N., 25° 50′ W., 29.27, w.n.w., force 6, very high sea, hailing; in 45° 35′ N., 25° 15′ W., 29.48, w., force 7, very high sea, rain and hail; in 45° 44′ N., 40° 14′ W., 29,64, w. to n.w., force 8, rain and hail showers; in 45° N., 41° W., n.w., heavy gale, frequent violent squalls, very high sea; in 45° N., 39° W., w.n.w., wild breaking sea, tremendous squalls; in 45′ N., 41° W., n.n.w., strong gale, high sea, heavy squalls; in 48° N., 36° W., w. to n.n.w., tempest and hurricane, very high sea, much water on deck, slowed engines for 14 hours and then hove to. 17th, in 48° N., 30° W., w.n.w. to w.s.w., strong, very high sea; in 44° N., 44° W., n.w., heavy gale, frequent violent squalls, tremendous sea; in 44° N., 43° W., w.n.w., tremendous squalls, wild breaking sea; in 46° N., 40° W., w. to n.w. and n., tempest, very high sea, much water on deck, rain and hail, slowed engines and hove to for six hours; in 48° 45′ N., 20° 05′ W., 29.05, s.s.w., force 2, raining; in 46° 50′ N., 21° 30′ W., 29.10, s.w., force 7, drizzling rain; in 44° 50′ N., 42° 14′ W., 29.46, w. to n.w., force 7 to 8, rain and hail showers, very high sea. 18th, in 49° 05′ N., 14° 30′ W., 29.28, s.w., force 6, very high sea, showery; in 48° 35′ N., 17° 35′ W., 29.21, s.w., force 7, very high sea, cloudy; in 51° N., 20° W., s.w. to n.w, strong gale, very high sea.

XXIV.—Central on the 14th in about 50° N., 30° W., this depression moved northeastward off the western coast of the

British Isles, during the 15th and 16th, accompanied by violent s.w. to n.w. gales, with rain and hail squalls. 17th, depression central north of the Shetland Isles, followed by southerly winds, with cloudy or rainy weather throughout nearly the whole of the British Isles. During this day and the following the depression filled up over Scandinavia.

XXXVII.—Central on the 25th in about 35° N., 53° W., this depression moved rapidly northeastward to the parallel of 50° N., disappearing on the 27th in an area of high pressure, 30.30, then prevailing off the western coast of the British Isles.

XLI.—This depression appeared central southeast of Newfoundland on the 28th. In 42° 14′ N., 54° 04′ W., 29.79, s.w. to n.w., force 3, foggy; in 42° 52′ N., 48° 51′ W., variable winds, five hours rain, foggy. During the 28th and 29th the depression moved northward to parallel 60° N., and on the 30th united with area xxxi., then central west of Iceland.

Of the storms first appearing in Europe, the following brief descriptions are given.

V.—Central on the 1st over the North sea, the depression moved slowly eastward over Denmark and southern Sweden, disappearing on the 4th south of the Gulf of Finland.

X.—Central in northern Italy on the 5th, the depression passed northeastward into southern Austria, where on the 6th the central area was inclosed by the isobar of 29.60. Passing north of Black sea on the 7th, the depression disappeared during the 8th, north of the Caspian sea.

XI.—This barometric disturbance appeared as a slight depression in central Spain on the 6th. During this day, and the following, it moved northeastward over the Mediterranean, being central south of Sardinia on the 11th, southeast of Sicily on the 12th, and disappearing over Asiatic Turkey on the 13th.

XVII.—This depression appeared over northern Lapland on the 10th, and by the following morning was central east of the the White Sea. On the 12th and 13th, a large area of 29.40 prevailed in the vicinity of the Ural Mountains between the parallels of 50° and 60° N. 13th, Ekaterinburg, 29.27, a fall of 0.18 inch, wind shifting from w.s.w. to n., snowing; Tashkend, 29.56, a fall of 0.24 inch, calm, cloudy; Kasan, 29.56, a rise of 0.03 inch, n., cloudy. During the 14th and 15th the depression passed eastward over southwestern Asia, and on the 16th disappeared beyond the Yenisei.

XXV.—This depression entered the extreme portion of northern Norway on the 14th, and passed slowly southeastward north of the White Sea, being central on the 17th in northwestern Siberia. On the 19th the depression disappeared eastward beyond the Yenisei.

XXXIII.—Central on the 20th southeast of the White Sea, the depression continued the same direction of movement until the following day, when it changed to the northeast, and on the 22nd became central in the valley of the Obi. On the 23d the depression disappeared eastward beyond the Yenisei.

XXXVIII.—This depression first appeared in southern France on tle 26th, and moved thence northeastward over northern Italy and southern Austria, being central, on the 29th, north of the Black Sea. On the 30th disappeared over southeastern Russia.

XLII.—Central on the 28th over Finland, the depression passed slowly eastward along the parallel of 60° N., and, on the 30th, became central in northwestern Siberia. The continuation of this area will probably appear on chart v., for May, 1880.

Of the storms appearing on the Asiatic coast the following brief descriptions are given:

VII.—This depression is probably a continuation of area xxvii., of chart v., for March, 1880.

XV.—Appeared central south of the Island of Formosa on the 8th, and moved thence northeastward, being, on the 10th, central north of the Island of Kinsin. During the day the depression moved southeastward over Japan and disappeared on the 11th in about 30° N., 140° E.

XXX.—This depression passed northeastward from the province of Amoor on the 19th, disappearing over the Okhotsk Sea on the 20th.

XXXIV.—Central south of the Amoor in the province of Manchooria on the 21st, the depression moved northeastward over the province of Amoor and, on the 23d, disappeared over the Okhotsk Sea. 22nd, Nikolaievsk, 29.70, a rise of 0.01 inch, wind changed from calm to n.e., cloudy. Nertchinsk, 30.14, a rise of 0.20 inch, wind shifted from e.s.e., to w.s.w., calm, clear.

XXXV.—This depression appeared on the 21st over the Yellow sea, inclosed by the isobar of 29.70. At Japanese stations the winds shifted from se. to ne., with rapidly falling barometer; Nagasaki, 29.80, a fall of 0.38 inch, e.n.e., raining, 2.21 inches rainfall in past 24 hours; 22d, central over the southern portion of the Japan sea; Hiroshima, 29.64 a fall of 0.42 inch, s., cloudy, 18.19 mm. rainfall in past 24 hours; Nagasaki, 29.74, a fall of 0.06 inch, w.s.w., cloudy; Tokei, 29.95, a fall of 0.32 inch, s.s.w., raining, 21.72 mm. rainfall in past 24 hours; Wakayama, 29.64, a fall of 0.53 inch, e., raining, 6.50 mm. rainfall in past 24 hours; 24th, Tokei, 29.47, a fall of 0.48 inch, s.w., clear; Wakayama, 29.61, a fall of 0.03 inch, s., fair; Hiroshima, 29.65, a rise of 0.01 inch, w., clear; Nagasaki, 29.77, a rise of 0.03 inch, w.s.w., cloudy. During the 24th the depression disappeared east of the Island of Yesso.

XXXVI.—This depression appeared central in the western portion of the Province of Macchooria on the 25th; Nertchinsk, 29.61, a fall of 0.41 inch, calm, cloudy; 26th, central in the Province of Amoor: Nertchinsk, 29.81, a rise of 0.20 inch, n.w., clear; Nikolaievsk on the Amoor, 29.76, calm, clear. 27th, Nikolaievsk, 29.58, a fall of 0.18 inch, e., cloudy; Nertchinsk, 29.88, n.w., clear; 28th, Nikolaievsk, 29.52, a fall of 0.06 inch, w., cloudy. On the following day the depression disappeared to the eastward over the Okhotsk sea.

XLIII.—This appeared as a slight but extensive depression over northeastern China and the Japan sea on the 29th and 30th, a continuation of which will probably appear on chart v. for May, 1880.

### OCEAN ICE.

February 12, 1882, in 46° 50′ N., 47° 00′ W., bark "Johannes" passed two large icebergs and large quantities of field ice. February 18th, in 46° N., 49° W., bark "Nova Scotia" passed through large quantities of drift ice; 22d, in 44° 60′ N., 45° 30′ W., bark "Argonaut" passed large iceberg 70 feet high. February 23d, the s. s. "Helvetia" reported having met with immense fields of ice floating northward to the banks; in 47° N., 47° W., she was completely surrounded by ice; 24th, s. s. "Bavarian," in 45° N., 48° W., passed an iceberg and large quantities of drift ice; same date, in 45° 30′ N., 49° 00′ W., s. s. "St. Germain" was in an immense ice-field; 23d, in 45° 20′ N., 46° 00′ W., s. s. "New York City" passed large quantities of pack ice and several icebergs from sixty to three hundred feet high; 26th, in 46° 00′ N., 47° 54′ W., s. s. "City of Lincoln" passed ice; same date, in 43° 10′ N., 49° 00′ W., s. s. "City of Paris" passed field ice and one small iceberg; in 44° 00′ N., 49° 00′ W., s. s. "Palestine" passed large quantities of field ice and small icebergs; 27th, in 46° 20′ N., 47° 00′ W., s. s. "Rialto" ran into a field of ice and several large icebergs; ice being so heavy, stove in both bows, and was obliged to steer s.e. for two hundred miles to clear the ice; 28th, in 43° 59′ N., 48° 32′ W., s. s. "Main" passed a large icefield; same day, in 46° 26′ N., 41° 25′ W., s. s. "Persian Monarch" passed large quantities of ice; March 1st, in 44° 46′ N., 49° 29′ W., s. s. "Elbe" passed several icebergs and large icefields; March 1st, in 43° 35′ N., 49° 10′ W., s. s. "Germania" passed large fields of ice. The s. s. "Istrian" reported: March 1st and 2d, passed through large quantities of ice, extending in length from forty to fifty miles. The s. s. "Rotterdam" between 46° 30′ N., 46° 00′ W., and 44° 00′ N., 52° 00′ W., passed 27 icebergs, and had to cross an icefield. In 44° 58′ N., 46° 41′ W., s. s. "Persian Monarch" passed a quan-

tity of field ice. March 2d, in 43° 45′ N., 48° 40′ W., s. s. "Lake Champlain" passed large quantities of field ice and several icebergs; 7th and 8th, s. s. "Oder" between 45° 09′ N., 48° 50′ W., and 44° 52′ N., 50° 03′ W., passed numerous icebergs and floating ice. Steamer "Otranto" reported: March 6th, (no position given) at 2 p. m., passed an iceberg of great size and from that time up to 10.30 p. m., passed 16 others and field ice extending as far as the eye could reach; 10th, in 47° 00′ N., 46° 30′ W., s. s. "Thornholme," passed a large iceberg, also ice-field five or six miles long, also, on 11th, at 6 a. m., passed two very large icebergs, one of which was estimated to be four miles in length, and was very high; 18th, in 44° 04′ N., 47° 53′ W., s. s. "Salier," passed several large icebergs; 21st, Bark "Fremad," two days sail from New York, passed through large field of ice. The s. s. "Newfoundland" at St. Johns, N. F., March 28th, reports two vessels jammed in the ice, thirty miles sw., of Cape Pine, also heavy ice everywhere on the coast; 14th, in 43° 29′ N., 49° 05′ W., s. s. "Batavia," passed an iceberg; 10th, in 42° 30′ N., 50° 00′ W., s. s. "City of Brussels" passed a small iceberg; 13th, in 44° 39′ N., 47° 36′ W., s. s. "Devonia," passed several small icebergs; 12th, in 44° 09′ N., 49° 12′ W., s. s. "Donau," passed two icebergs; 14th, in 42° 31′ N., 50° 05′ W., s. s. "Erin," passed an immense iceberg; 17th, in 43° 35′ N., 49° 10′ W., s. s. "Glamorgan," passed two large icebergs, from three hundred to five hundred feet long and one hundred feet high; 11th, in 45° 58′ N., 48° 40′ W., s. s. "Iberian" passed through large quantities of field ice, and saw several large icebergs: 15th, in 43° 47′ N., 49° 60′ W., s. s. "Lake Manitoba" passed three icebergs. March 3d, bark "Plymouth" in 43° 40′ N., 50° 25′ W., passed through about 20 miles of field ice and saw several icebergs: 19th, in 46° 30′ N., 47° 30′ W., s. s. "Limosa" passed through heavy field ice. The whaling steamer "Esquimaux" arrived at St. Johns, from Dundee, February 28th, and reports having been 13 days among vast fields of ice that stretched s. e. and s. over two hundred miles from the Newfoundland coast. The pack caught her tightly and she remained in it until she drifted up to St. Johns' Harbor. At last accounts, five steam whalers are visible from Cape Spear, locked in the ice and drifting helplessly southward. Between Cape Race and Cape Bonavista there are now driving southward, no less than a hundred and fifty icebergs, and their rate is about 2¼ miles per hour.

## TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of March, 1882, is exhibited on chart ii, by the dotted lines in black. The table of mean comparative temperatures, in the lower left-hand corner of the chart, shows, in the first column, the average temperature for the month from the various districts, as determined from observations taken at Signal Service stations during the month of March of previous years; the second column shows the mean temperature for the current month; the third column shows the departure of the mean temperature of the current month from the mean of several years. The temperature is above the normal in all districts east of the Rocky mountain range; and below the normal in the districts on the Pacific coast, except in Oregon and Washington Territory, where it has averaged about 8° above the mean. It has ranged from 4° to 5° above the normal in the southern states, Ohio and Missouri valleys; about 3° above in the middle states and lake region; about 5° below in the middle plateau region; and about 1° below in California.

### DEVIATIONS FROM MEAN TEMPERATURE.

Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of chart ii. The following items of importance, in connection with this subject, are reported by voluntary observers:

*Connecticut*: Southington, mean temperature varies less than 1° from the average of past 12 years and has not been marked by extremes.

*Illinois:* Riley, mean temperature 33°.8 or 3°.8 above the average of past 21 years; higher mean temperatures occurred in 1868, '71, '78 and '79.

*Indiana:* Vevay, mean temperature 50°.27 or 7°.47 above the average for past 17 years. Mean temperature of winter, beginning with December, 1881, and ending February 28th, 1882, is 41°.23 or 7°.9 above the average winter mean for past 17 years.

*Iowa:* Clinton, mean temperature slightly above the average.

*Kansas:* Lawrence, mean temperature 46°.90 or about 5°.42 above the average of past 14 years; mean temperature for the month at 7 a. m., 40°: at 2 p. m, 55°.93; at 9 p. m. 45°.85. Yates Centre, mean temperature 46°.5 or 8°.4 above the average of past 2 years. Wellington, mean temperature 47°.4 or 3°.3 above the average of the past 3 years and 2°.2 below the mean of March, 1879.

*Maine:* Gardiner, mean temperature 28°.91 or 0°.91 below the average of past 56 years. Mean temperature of winter (from December, 1881, to March, 1882, both inclusive) is 24°.35 or 1°.24 above the average of the past 46 years. The lowest temperature of the past winter—27° occurred January 25; the lowest on record at this place—40°, occurred in January, 1857; the highest minimum temperature for any winter during that period—12°, occurred in January, 1845. During the past winter the temperature fell below zero on 21 dates; during the winter of 1855–6. on 59 dates, and during the winter of 1841–2, on only 10 dates.

*Maryland:* Fallston, mean temperature 41°.52 or 2°.67 above the average of past 11 years; during that period the highest mean 46°.20 occurred in 1871, and the lowest 32°.90 occurred in 1872.

*Michigan:* Thornville, mean temperature 35°.9 or about 5° above the average of the past 15 years.

*Missouri:* St. Louis, Missouri Weather Service reports mean temperature 47°.6 or about 4° above the average of the past 45 years. During that period the mean of March, 1882, has been exceeded 13 times; the highest mean 56°.5 occurred in 1842; the lowest 27°.5 in 1843; Protem, mean temperature 55.45, the highest since 1860.

*New Hampshire:* Contoocookville, mean temperature 31°.5 is about the average for March for the past 12 years.

*New York:* Waterburg, mean temperature, 33.1 which is the highest that has occurred during the past 11 years with the exception of March, 1878, mean 37°.4; North Volney, mean temperature 51°.59 or 2°.76 above the average of past 14 years. During that period the highest monthly mean 37°.39 occurred in 1878; lowest 21°.15 occurred in 1872.

*Ohio:* North Lewisburg, mean temperature 42.0 or 3°.3 above the average of 51 years.

*Pennsylvania:* Wellsboro, mean temperature much higher than for any previous year since 1856.

*Virginia:* Wytheville, mean temperature 45°.6 or 3° above the average of past 18 years.

*West Virginia:* Helvetia, mean temperature 44.68 or 4°.67 above the average of the past 6 years.

### RANGES OF TEMPERATURE AT SIGNAL SERVICE STATIONS.

Monthly ranges of temperature during the month of March varied from 19° to 89° at stations east of the Rocky mountains, and from 32° to 75° at stations on the Pacific coast. The smallest ranges are: Key West, 19°; Port Eads, 23°; Punta Rassa, 27°; New Orleans, 28°; San Francisco, 32°; Mobile and Hatteras 33°; Delaware Breakwater, 34°; Brownsville, Tex., 37; San Diego, 39°. The largest: Ft. Buford, Dak., and Ft. Shaw, Mont., 89°; Ft. Benton, Mont, 88°; Bismarck, Dak., 87°; Ft. Bennett, Dak., 84°; Huron, Dak., 81°; Ft. Assinnaboine, Mont., and Yankton, 80°; Ft. Missoula, Mon., and Ft. Washakie, Wyo., 78°; Ft. Keogh, Mont., 76°; Ft. Custer, Mont., and Eagle Rock, Idaho, 75°. The daily ranges varied in the different districts as follows: New Eng-